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Evaluation of Fungicides to Control Cedar Leaf Blight on Western Red Cedar at Humboldt Nursery

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ABSTRACT

Efficacies of fixed copper, benomyl, and triadimefon were compared for protection against cedar leaf blight on western red cedar at the Humboldt nursery in northern California. Level of disease severity was lowest and height and caliper greatest for seedlings sprayed monthly with triadimefon. On the average, triadimefon-treated seedlings had less than 20% of foliage lost due to Didymascella as compared to 61 to 80% of foliage infected in untreated plots. One season after outplanting, all untreated western red cedar seedlings naturally infected with cedar leaf blight had survived and put on new growth.

INTRODUCTION

Periodically throughout the past decade, leaf blight of western red cedar caused by Didymascella (Keithia) thujina (Durand) Maire has produced significant damage to western red cedar seedlings at the Humboldt Nursery. In 1988, over 60,000 seedlings were culled due to moderate to heavy fungal infection.

Western red cedar trees of all sizes are susceptible to this leaf blight, but seedlings and saplings are damaged most severely. Fungal infection is confined to the needles, but even moderate attack may lead to the death of the entire shoot, possibly due to toxins produced by the fungus. Damage first appears in the spring on lower foliage, and is encouraged by low light and high humidity (Sinclair et. al., 1987).

Infection may begin in autumn, but most commonly starts in spring when ascospores that have overwintered on green foliage germinate and the fungus penetrates the leaves. Symptoms appear on 1-year-old foliage in spring as small bleached areas, one or more per leaflet, usually on the upper surface.

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EXPERIMENT STATION

Fruiting bodies are visible in June. Reddish brown to olive brown spots appear in the center of dead areas on leaflets. These spots become black at maturity. Ascospores are produced from July to October, peaking in late summer and early autumn. They are thick walled and covered with a sticky shealth by which they adhere to foliage prior to germination and infection. Eventually the friuting bodies (apothecia) disintegrate, leaving the plant with a shot hole appearance. Severely infected leaflets often fall in autumn. Killed leaves that remain on tree turn gray (Sinclair et. al., 1987).

Effective control of Didymascella has been achieved with cycloheximide in Great Britain, but this chemical is highly toxic and difficult to obtain (Anonymous, 1967.). The objective of this study was to compare the effectiveness of several registered fungicides for control of this disease.

METHODS

Plots were established in 1-0 western red cedar at the USDA Forest Service Humboldt Nursery in northern California. A randomized complete block design was used with the 4 treatments replicated 4 times. Each replicate measured 20 feet of bed (4 x 5 foot plots). The following chemicals were applied monthly from March through November 1989 using a backpack sprayer:

1. triadimefon (Bayleton) - 1 lb/acre (2.3 g/gal.)
2. benomyl (Benlate) - 1 lb/acre (4.6 g/gal)
3. tribasic copper (Tennessee Brand) - 3 lbs/acre (13.6 g/gal)
4. control - water only.

At the end of the growing season (December, 1989) 20 randomly selected seedlings from each plot were harvested for disease evaluation and growth measurements. Seedlings were clipped at the soil line, and height and caliper at the base were measured, and disease incidence rated. Severity of disease was rated on a 5 point scale, where 1 = less than 20% of foliage infected, 2 = 21-40% of foliage infected, 3 = 41-60% of foliage infected, 4 = 61-80% of foliage infected, 5 = 81-100% of foilage infected. Analysis of variance and Tukey test for pairwise comparisons were used to compare differences among means.

To evaluate the impact of cedar leaf blight on outplanted seedling survival, 263 2-0 western red cedar seedlings naturally infected in the nursery were studied. Moderately infected seedlings, which had been rejected by the purchasing District, were auger planted on a 2 x 3 foot spacing near Happy Camp, California. Tree survival was determined after one growing season.

RESULTS AND DISCUSSION

Monthly application of triadimefon protected seedlings from cedar leaf blight infection. Benomyl, and copper were less effective (see Table 1).

Table 1. Disease severity, height and caliper of western red cedar seedlings sprayed monthly for protection against cedar leaf blight. Disease rating is based on a 5 point scale.

Treatment[1]	Disease rating[2]	Height[2] (cm)	Caliper[2] (mm)
triadimefon	0.98a[3]	44a	6a
benomyl	2.48b	38a	5b
copper	3.73c	33a	5b
control	4.00c	33a	4b

[1] Rates used: triadimefon - 8 oz/100 gal, benomyl - 8 oz/100 gal, copper - 3 lbs/ 100 gal, control - water only.

[2] Average of 80 randomly selected seedlings per treatment.

[3] Values followed by the same letter are not significantly different (p=0.05).

Disease rating and caliper of triadimefon-treated seedlings were significantly different from all other treatments including controls (p=0.05). Disease rating of benomyl treated seedlings was also significantly different (p=0.05) from control and copper-treated seedlings. Triadimefon-treated seedlings were 25% taller and caliper 33% larger than untreated controls. On the average, triadimefon-treated seedlings had less than 20% of foliage lost due to Didymascella as compared to 61% to 80% of foliage infected in untreated plots.

Literature suggests that, since the disease is humidity dependent, wider spacing should reduce disease severity (Sinclair, et. al. 1987). Seedling spacing was not systematically analyzed in this study. However, wide spacing of cedar did not appear to reduce infection level. Adjacent untreated beds of western red cedar became infested with Didymacella (Keithia) blight whether they were widely spaced or in dense clusters.

After one growing season, no naturally infected western red cedar outplanted at Happy Camp had died. Seedlings were vigorous and have put on new growth. The 100% survival of the infected seedlings outplanted at Happy Camp indicates that moderately infected seedlings will survive following outplanting.

Further testing is needed to see if the number of triadimefon sprays can be reduced. Three applications of cycloheximide (late March, late April, and mid June) successfully controlled Didymascella in Great Britian.

CONCLUSIONS

Benomyl (Benlate), applied monthly at 8 oz/100 gal throughout the growing season, effectively controlled Septoria leaf spot on white alder. Spray

treatment should be started at the time first leaves are fully emerged and continued throughout the growing season. Red alder seedlings should be monitored for disease development. If disease is detected, monthly sprays of benomyl may be needed.

LITERATURE CITED

Agrios, George. 1988. Plant Pathology, 3rd Edition. Academic Press, San Diego, Ca. pp. 357-359.

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